

**GEOLOGY 2254****PRACTICAL MINERALOGY****FALL 2005**

Lecture MWF, 8:30AM-9:20AM NRC 207  
 Lab T 8:30AM-11:20AM, NRC 004 OR  
 Th 8:30A-11:20A, NRC 004

**PROFESSOR**

Dr. Elizabeth Catlos

Office: NRC 407

Office Hours: MW 9:30-10:30AM, or by appointment

email: catlos@okstate.edu

Office phone: 744-9246 (direct) or 744-6358 (dept. office to leave message)

**TEACHING ASSISTANT(S)**

Name:

Office:

Office Hours:

email:

**COURSE DESCRIPTION:** *(From the undergraduate course catalog)* GEOL 2254 Practical Mineralogy. Lab meets for 3 hours. **Prerequisite: CHEM 1314, CHEM 1515, GEOL 1014, or GEOL 1114.** Hand-specimen identification of minerals. Society's dependence on and utilization of mineral resources. Field trips required.

*(From the instructor)* Minerals are the fundamental building blocks of all rocks, and consequently the Earth and other planets. **Mineralogy combines elements of physics, chemistry, math, and geology and is a descriptive, analytical, and experimental science.** Mineralogists try to understand the physical properties, chemical composition, crystal structure, occurrence, and distribution of minerals, and the physical and chemical processes that lead to the formation and destruction of minerals in nature. Knowledge of mineralogy is the basis for the understanding of geological processes, including the formation and alteration of the Earth and other planets as a function of time. Many minerals influence the economy and play a meaningful role in political decision-making. Minerals stimulate the development of important technological materials (metals, semiconductors, building materials, glasses, ceramics). Many modern analytical methods and instruments were developed so that mineralogical and geochemical problems could be solved.

**TEXTBOOKS** *all books are on reserve in the library*

Required: Klein, C. (2002) The 22<sup>nd</sup> Edition of the Manual of Mineral Science, ISBN # 0-471-251771. John Wiley and Sons.

Purchase a handlens from the bookstore

Optional, but strongly suggested:

Nesse, W.D. (1991) Introduction to Optical Mineralogy, 1991. ISBN # 0-19-506024-5. Oxford University Press

Deer, Howie & Zussman, An Introduction to the Rock-Forming Minerals, ISBN # 0582-30094-0.

**Read and gain a general understanding of the assigned materials before the lecture for which they are assigned.** Class lectures move rapidly, and your advance reading helps you keep up.

**GRADING**

Two in-class mid-term exams and the Lecture final: (15% + 15% + 15% = 45%)

Homework + Poster Presentation: (10% + 15% = 25%)

Lab exercises and Lab Final (15% + 15% = 30%)

100-90=A;

89-80=B;

79-70=C;

69-60=D;

&lt;59=F

**FORMAT AND SCOPE OF EXAMS**

Two exams will be held during regular lecture class time and will consist of short answer questions. In some cases, mineral and rock specimens may be used. The first exam will be on the material in the course from the beginning of class to the exam, and the second exam will cover material since the first until the second exam. **Both the lab and lecture finals are comprehensive.** All exams are closed book and closed notes. No materials can be used during the exams to assist you. No books, papers, notes, or other items (newspapers, magazines, backpacks, etc.) are permitted

in the exam area at the time of the quiz or midterm. No talking, other than questions about the tests, directed at the professor or TA, is permitted.

### **MAKE-UP EXAMS**

All exams must be taken at the scheduled time unless you have a documented conflict and made arrangements with Professor Catlos before the exam or you have a medical emergency and you bring proof of this to the instructor before final grades are computed. In any other case, missing the exam will result in a grade of "F" for that exam.

### **HOMEWORK**

Starting the second week, homework will be assigned every Friday to be completed and turned in the following Friday. The goals of these assignments are to get you to explore the mineralogy and geology resources available in the OSU library and to make sure you are keeping up with the course readings. Make sure the CD that comes with the Wiley textbook works!

### **LABS**

Labs are handed out on Monday during lecture and are due at the end of the lab period. Labs in this class run 2 hours and 50 minutes. During this time, you will be expected to complete a set of practical exercises that will help you identify minerals and understand their properties and chemistry. During some lab times, we will take field trips. Come to lab on time and prepared. You will have read the handout for each exercise before lab begins. Bring a pencil, the textbook, colored pencils, a hand lens, and a professional attitude.

### **MAKE-UP LABS AND HOMEWORK**

It is expected that you will complete every lab and homework. **Due to the nature and intense preparation involved in setting up these lab assignments, if you miss a one, it is not possible to make it up.** The TAs and I reserve the right to use weekly lab attendance as a guide to adjust final lab and homework grades. You have one week to complete each homework assignment, so we will NOT accept late assignments. Translation: **DO ALL THE LABS AND HOMEWORK.**

### **FIELD TRIPS (Field Trip Fee for the course is \$30)**

We hope to take several field trips in this class-- one-day trip to Ponca City's Kaw Lake to collect geodes, a trip to the Great Salt Plains where we will dig for gypsum crystals, and another trip to visit the Gem and Mineral Collection at OU. These field trips will be scheduled to ensure maximum class participation. On these trips, you may be able to collect mineral specimens and the best ones can be displayed in the cases outside the Mineralogy lab. During lab, we will be making short trips to Leonard Jewelry, the OSU Electron Microprobe Laboratory, the OSU Crystal Growth Laboratory, and the OSU Edmond Low Library.

### **PHILOSOPHY**

The expectation for all students in this course is that complete integrity will be demonstrated at all times. Violations of academic dishonesty will be reported for administrative action. Although I encourage you to discuss the lab problems with each other and me, your answers should be written only by you. I expect that you will collaborate with your classmates in completing the lab exercises for this class. Asking each other questions, discussing samples, etc., are absolutely necessary to successfully complete the work you are faced with. However, it is unacceptable to turn in any work that is not your own. Cooperation = good, Plagiarism = bad.

While there is no point penalty specified for class absences, experience has shown a definite correlation between poor class attendance and low grades. Keep all class and lab-work in a jumbo 3-ring binder. Periodically, I may check to make sure that you are staying organized. Think of this class as a job: I expect you to show up on time, work hard, and make every effort to learn.

### **POSTER PRESENTATION**

Nearing the end of the class, you will put together and present a poster about an unusual mineral that we will assign during the first lecture. You probably won't have heard of this mineral, but over the course of the semester, you will find information about the mineral by completing weekly homework assignments. By the end of the semester, you will compile this information in a poster form using PowerPoint. The TAs will print the poster for you. You will then write a one paragraph abstract (to be compiled in an OSU Abstracts Volume), and give a timed presentation

about what you found about the mineral. The lab class period and the last week of lecture will be dedicated to poster presentations.

### UNDERGRADUATE AWARD



The student with the highest grade in this class will be nominated for the Mineralogical Society of America's American Mineralogist Undergraduate (AMU). This Award recognizes outstanding students who have shown an interest and ability in the discipline of mineralogy. The student will be presented with a certificate at an awards ceremony and receive a *Reviews in Mineralogy and Geochemistry* or *Monograph* volume chosen by the student. For more information, see:

[www.minsocam.org/MSA/Awards/UnderGrad\\_Award.html](http://www.minsocam.org/MSA/Awards/UnderGrad_Award.html)

Our past winners are: Ms. Kallina Marie Crary (July 2005), Mr. Brian Anthony Moss (Jan. 2005), Ms. Libbi Lindersmith (Jan. 2003) and Mr. Michael Andrew Sample (Jan. 2002).

The 2006 winner will be presented with the award at the School of Geology Spring Banquet.

### SCHEDULE OF LECTURES, READINGS, AND EXAMS (subject to change as course progresses)

Week/Dates	Brief Description of the Topics Covered	Reading
<b>Week 1</b>	<b>MINERAL PROPERTIES &amp; OCCURRENCES</b>	
Aug 22	Course Outline & Details. Intro to Mineralogy	Chp. 1
Aug 24	Intro to Mineralogy, cont.	
Aug 25	Mineral Properties I	Chp. 2
LAB 1	RESEARCH IN MINERALOGY - FIELD TRIP TO THE LIBRARY!	
<b>Week 2</b>		
Aug 29	Mineral Properties II	
Aug 31	Review Plate Tectonics, Earth Crust Composition & the Atom	Chp. 3
Sept 2	The Ion & Bonding Coordination & Crystal Structure I	
LAB 2	MINERAL PROPERTIES	
<b>Week 3</b>		
<b>Sept 5 HOLIDAY</b>	<b>LABOR DAY - HOLIDAY</b>	<b>HOLIDAY</b>
Sept 7	Coordination & Crystal Structure I	
Sept 9	Coordination & Crystal Structure II	
LAB 3	MINERAL CLASSIFICATION-WHAT'S IN A NAME?	
<b>Week 4</b>		
Sept 12	Compositional Variation & Graphical Representation	
Sept 14	Crystals & Reactions	
<b>Sept 16</b>	<b>Review and Catch Up</b>	<b>Chp. 4</b>
LAB 4	IGNEOUS MINERALS	
<b>Week 5</b>		
<b>Sept 19</b>	<b>LECTURE EXAM 1</b>	<b>Chp. 1-4</b>
Sept 21	Mineral Stability	
Sept 23	Metamict Minerals, Mineraloids, Pseudomorphism, & Defects	
LAB 5	SEDIMENTARY MINERALS	
<b>Week 6</b>		
Sept 26	Polymorphic Reactions & Exsolution	Chp. 4 (cont)
Sept 28	Origin of Twinning, Color	
Sept 30	Origin of Magnetic Properties, & Radioactivity	
LAB 6	METAMORPHIC MINERALS	
<b>Week 7</b>	<b>SYMMETRY &amp; CRYSTALLOGRAPHY</b>	
Oct 3	Intro to Crystallography; Symmetry Operations	Chp. 5
Oct 5	Symmetry Operations II	
Oct 7	Crystal Morphology and Notation I	
LAB 7	ECONOMIC MINERALS	

<b>Week 8</b>		
Oct 10	Twins revisited, brief intro to lattices	
Oct 12	Crystal Morphology and Notation II	
Oct 14	Point Groups I	Chp. 6
LAB 8	SYMMETRY LAB 1	
<b>FALL BREAK</b>	<b>FALL BREAK – HOLIDAY – NO LAB THIS WEEK</b>	<b>FALL BREAK</b>
<b>Week 9</b>		
<b>PART 3: METHODS IN MINERALOGY</b>		
Oct 19	Point Groups II	
Oct 21	Intro to Optical Mineralogy	Chp. 7
<b>Week 10</b>		
Oct 24	Relating Optical Mineralogy and Symmetry	
Oct 26	Optical Properties of Isotropic Materials	
Oct 28	Optical Properties of Anisotropic Materials 1	
LAB 9	SYMMETRY LAB 2	
<b>Week 11</b>		
Oct 31	Optical Properties of Anisotropic Materials 2	
Nov 2	Uniaxial Optics 1	
Nov 4	Uniaxial Optics 2	
LAB10	OPTICAL MINERALOGY LAB 1	
<b>Week 12</b>		
<b>Nov 7</b>	<b>Review and Catch Up</b>	
<b>Nov 9</b>	<b>LECTURE EXAM 2</b>	<b>Chp. 4-7</b>
Nov 11	Probing the Structure of Minerals; X-ray Diffraction	Chp. 7
LAB 11	OPTICAL MINERALOGY LAB 2	
<b>Week 13</b>		
Nov 14	X-ray Diffraction 2	
Nov 16	Intro to Scanning Electron Microscopy	
Nov 18	Intro to Transmission Electron Microscopy & Electron Microprobe	
LAB 12	OPTICAL MINERALOGY LAB 3	
<b>Week 14</b>		
Nov 21	Systematic Descriptions :Native Elements & Sulfides & Sulfosalts	Chp. 8
Nov 23	Systematic Descriptions, Oxides & Hydroxides & Halides	Chp. 9
<b>Nov 25 HOLIDAY</b>	<b>THANKSGIVING – HOLIDAY – NO LAB THIS WEEK</b>	<b>HOLIDAY</b>
<b>Week 15</b>		
Nov 28	Systematic Descriptions, Carbonates, Nitrates, Borates, Sulfates	Chp. 10
Nov 30	Chromates, Tungstates, Molybdates, Phosphates, Arsenates, Vanadates	
Dec 2	Cont...	
LAB 14	POWERPOINT PRESENTATIONS	
<b>Week 16</b>		
Dec 5	Cont..	
Dec 5	POSTER PRESENTATIONS	
Dec 7	POSTER PRESENTATIONS	
Dec 9	POSTER PRESENTATIONS	
LAB 15	LAB FINAL	
<b>FINAL EXAM: Monday, December 12 at 8:00-9:50AM in NRC207</b>		